

Computers and Internet
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In the beginning, there was ENIAC. Before the beginning, there were abacusses (abaci?), Pascal, Babbage, and von Neumann, but the first *electronic* computer was the Electronic Numerical Integrator And Computer, fondly known as ENIAC.

ENIAC was built for the United States Ballistics Research Lab during World War II to calculate ballistic tables. I couldn't find the clock speed, but it could perform 5000 addition or subtractions every second - a blazingly fast speed in the mid-1940s, and over 100 times faster than any mechanical system. ENIAC was built with hollow-state devices - nearly 18,000 tubes - and barely fit into a very large room. It was programmed by hard-wiring modules to perform tasks in a specific sequence. It could perform nested loop programs (such as FOR N= 1 to 25), and the programmers (mostly females) discovered that they could perform a "magnitude discrimination" operation, which we know as the IF...THEN or conditional branch, a key instruction in modern programming languages. Punch cards and printers were used to get data into and out of the machine. To read a copy of the user manual and then operate a simulated ENIAC to get a better sense of what it was like, visit <<http://www.seas.upenn.edu:8080/~museum/qman/node2.html>>

The first commercial computer was the Universal Automatic Computer or UNIVAC, introduced in 1951. The first UNIVAC was used by the US Census Bureau, and later customers included the US Air Force, US Army, the Atomic Energy Commission, General Electric, US Steel, and Metropolitan Life. UNIVAC became a household word when UNIVAC I correctly predicted Eisenhower's landslide victory in the US Presidential election - most people thought it was going to be a lot closer than it was.

The UNIVAC I was a huge device, nearly 1000 cubic feet and 15 tons, running with an 8 kHz clock and 9 kB of memory. It was this computer that is generally credited with bring computers into regular business use, a fact which Unisys apologized for on the 50th anniversary of it's public introduction last June. Browse to <<http://www.unisys.com/news/releases/jun/06148026.asp>>.

But, even the UNIVAC was still built with vacuum tubes. In 1952, the transistor was a costly and still rare device, with most of the commercial offerings being of the point-contact type, virtually hand-made. See Figure 1. The first computers built with transistors entered the market in 1956, dramatically altering the fledgling computer industry.

Until the early 1970s, only businesses bought computers. Some hobbyists were designing their own computers, or adapting obsolete models - witness the founding of the American Computer Society in 1966 - but only a few chipsets were available, mandating considerable effort to build anything. In 1973, the first complete kit, the Scelby-8H, was sold by Scelbi Computer Consulting Company for \$565 with 1 kb memory. A 15 kb upgrade was available for \$2700.

By 1974, both Radio Electronics and Popular Electronics featured computer construction articles, the latter for the Altair 8800, arguably the first "home" computer. Offered by MITS in kit form for \$439, actual hardware and software (Paul Allen and Bill Gates' BASIC) wasn't available until the second quarter of 1975. MITS sold thousands of these.

Around this point is when the computer industry really takes off. On April 1, 1976, Steve Jobs and Steve Wozniak form the Apple Computer Company. In early 1977 Commodore shows prototypes of the PET, Microsoft becomes a company, and through the year Apple introduces the Apple II for \$1300 and Radio Shack introduces the TRS-80 for \$600.

At this point, you had a dozen or more companies competing for the home computer market. Only a few used a common Operating System (OS), most were standalones, requiring that you either wrote your own software applications (usually in BASIC), or bought whatever your computer's maker offered. Applications like Wordstar and VisiCalc were just on the market, ported to a few popular machines, but there was no unified marketplace. The market included Hewlett packard, Sinclair, Apple, Radio Shack, Commodore, Osborne, Xerox, and, of course, IBM.

Then came the revolution: IBM introduced the first Personal Computer, the IBM PC, which ran the venerable Intel 8088 at a clock speed of 4.77 MHz, in August 1981. For only about \$3000, you could get a single-floppy (5.25 inch, 160 kB) version with 64 kB of RAM, along with PC-DOS 1.0, BASIC, VisiCalc, Pascal and Easywriter 1.0. If you had \$6000 to spend, you could upgrade to the fully loaded version which includes color graphics. The operating system was the Disk Operating System (DOS) from a little start-up called Microsoft, run by some guy named Bill Gates. IBM wanted to buy DOS from Microsoft, but they decided to only license it to IBM, a business decision with well-known results.

The entry of the IBM-PC and, in 1983 the PC-XT (with a 10 MB hard disk, \$4995) was the start of the explosion of the PC industry. Despite the availability of well-known offerings like the Timex Sinclair 1000 (under \$100), the Commodore C64, the Kaypro II, it is the introduction of the Compaq Portable PC at the end of the year that really made a splash: It was one of the first that advertised "IBM-PC Compatible". Compaq spent a million dollars to create an IBM-compatible ROM-BIOS that didn't violate IBM's copyright. Although "portable" can be argued ("Luggable" was more popular), it could run the software for the popular IBMs, offerings which included WordPerfect and Lotus 1-2-3.

In the mid to late 1980s, even the word 'explosion' doesn't cover it. The IBM PCjr, MS Word, Turbo Pascal, Apple's famous "1984" commercial and the Mac II, Amiga, C128, CD-ROMs, Intel's 80386DX, PS/2, OS/2, VGA, pre-3.0 Windows, and Excel. The 1990's saw Windows 3.0, Video Toaster, AMD's 386 clone chips, Mac system 7.0, laptops, 64 bits, Zip drives, Palm Pilots, and 1 GHz Intel Pentiums. Visit some of the web sites listed in the Resources if you're interested in the details. I just can't fit them here.

And so went the birth of the personal computer industry.

Now that the brief history lesson is over, I'd like to reminisce about what it was like to actually use those early 1980's computers. In 1980, I was halfway towards my degree in Electrical Engineering, and the IBM-PC was way out of reach for a college student. We used a ?? for our computer science studies, with punch cards for program input and wide green and white paper for the printed output. Our worst fear in those days was "dropping the stack", where you dropped your carefully ordered stack of punch cards. It meant a few hours of sorting, at best. It could reduce you to tears.

That wasn't the first computer I used, however. In High School, we had access to another school's Hewlett Packard HP 2000 time shared system, running BASIC (which stands for *Bad Acronyms Sicken Intelligent Computers*). We typed in our programs on a teletype terminal, and saved them by having the terminal punch out a paper tape.

My first computer was a Timex Sinclair 1000. This computer cost only \$99.99 with the standard composite video output and 1 kB of RAM. For another \$99 you could get the 16 kB RAM upgrade module, an option beyond my budget. Data storage was on a cassette recorder, and it ran BASIC. I don't recall being able to print, but I imagine it was because I just couldn't afford a printer. This computer was handy for doing calculations and learning about BASIC, but I lost interest after a few months, since it was so limited.

Once I got out into the real world (1983), I got a job where I pored over paper warranty claims and updated a regular report on failure types. The form was drawn, the data entered, and even the pie charts were all drawn by hand, every month. After a year, the department got a Panasonic *Senior Partner*, an IBM-compatible portable that was competing directly against the Compaq. It weighed about 20 pounds, but was self-contained, including a thermal dot-matrix printer. We entered the data into Lotus 1-2-3 version 1.0 (I still have a copy!) and plotted out the graphs in color using an HP-75 plotter. Those plots took nearly 5 minutes, and we made probably a half-dozen every month. But, we were grateful, the computer turned a week-long job into one that took only a day.

For fun, I wrote a program based on an article on Fractals that appeared in Scientific American. It was a simple BASIC program, less than 10 lines, that drew beautiful fractal images on the screen. The more points that were computed, the more intricate the detail. We were limited to three colors plus black, and I remember that 100,000 points was about the practical limit, a run which took a few hours. I once tried a million points, letting it run over the weekend, but it didn't look much better than the smaller ones. One of these days, I'm going to re-write that program and run it on my modern machine, just to see how many seconds it'll take.

In 1987 I started getting interested in owning my own computer. My colleague at work was upgrading to a 286 and offered to sell me his 8086 machine (with 8087 math coprocessor and color monitor!) for only \$1000 (Figure 2). I jumped at the bargain, and still use it regularly for Packet.

I've also owned a C64, a C128, a zillion 386 and 486 machines, and even a genuine Pentium (100 MHz). The machine I'm writing this on - a 300 MHz AMD K6-3D - is a workhorse, but it's age is starting to show when the kids play some of their games. I suppose I'll keep it as my work computer, and get something new for the kids to play on. And so, to earn enough money to afford a new computer, I keep writing columns for CQ.

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I'm writing this only a week after the attack of September 11. I'm sure that, by the time this gets into print, most of us will have come to terms with the events of that terrible, terrible day and we'll be still coping with the aftermath. Right now, it's still difficult to deal with, and 6000 people are still buried, somewhere in the rubble. In my December columns I have always offered my best wishes for peace, health and prosperity in the New Year to all my readers, but this year, it takes on a more significant meaning. Let's all try, really try, to keep the good feelings we get, by being kind and generous this time of year, alive throughout the whole year.

vy 73,

Don N2IRZ

Correction:

In the September column, the resistors in Figure 3 are shown reversed. Thanks to Tom Simko, WB2IVM, for pointing out my error. I've included an improved circuit this month.

Figure 1: An early point-contact transistor, type A1768. This example was made during the early 1950's in Allentown, PA and was given to me by Richard Wujciak, K2RW. Transistors made it possible to reduce the size of computers from building-size to desktop-size.

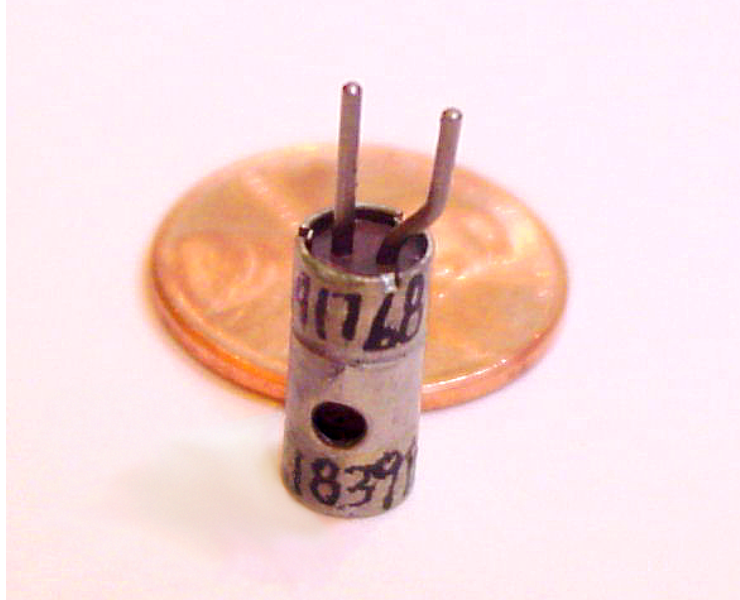
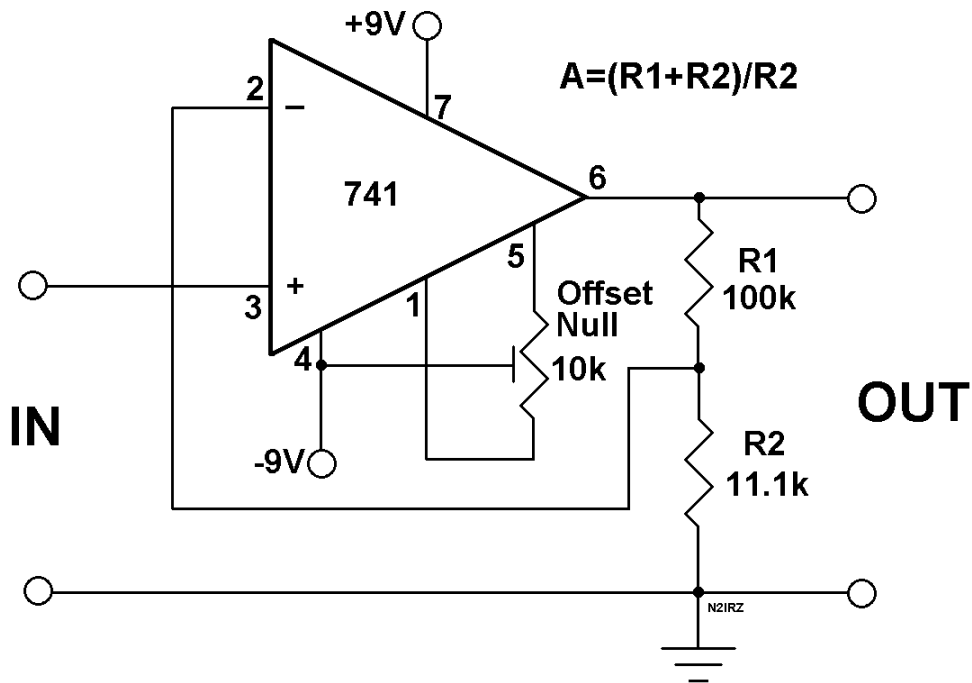


Figure 2: My Heath-Zenith kit PC. Built by my colleague Aram Setian, it was the only way for me to get an IBM-compatible computer in 1988 for under \$2000. It has a 20 MB Hard disk, 640 kB RAM, a Paradise EGA video card, and was upgraded with a 720k 3.5" floppy drive in addition to the 360k 5.25" floppy drive. I still use it regularly as my packet computer. It is now nearly 20 years old, and in all those years, it has failed only



once, when I blew out the parallel port driver IC playing with a stepper motor driver. Since everything is socketed, I repaired it in a half hour.

Figure x: A nice non-inverting DC instrumentation amplifier with a gain of 10 and the ability to null the DC output offset. This circuit was found in the August 2001 issue of Nuts & Volts, in an article by Ray Marston. This is a far better circuit than the very basic one I published in the September edition of this column. $\text{Gain} = (R1 + R2) / R2$.



Resources:

A superb chronology of modern computers (mid-1960s to present), compiled by Ken Polsson, can be found at <http://www.islandnet.com/~kpolsson/comphist>

A wonderful site on older computers, with a lot of photographs, historical details, and even a help line, can be found at <http://www.obsoletecomputermuseum.org>. If you have a unique old computer, and are looking for a nice home for it, visit this site.

Play a game of Spacewars, the first computer game, at [<http://el.www.media.mit.edu/groups/el/Projects/spacewar/>](http://el.www.media.mit.edu/groups/el/Projects/spacewar/). You can have a lot of fun with this game, but it's best with two players.

For a humorous look at computers, visit [<http://rinkworks.com/stupid/>](http://rinkworks.com/stupid/). I found myself laughing out loud quite often, much to the puzzlement of my XYL.
A comprehensive listing of computer history sites can be found at [<http://www.hitmill.com/computers/computerhx1.html>](http://www.hitmill.com/computers/computerhx1.html)

Another listing of computer history sites, and considerable original content, can be found at [<http://www.blinkenlights.com/>](http://www.blinkenlights.com/)

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